5 January 1968

MEMORANDUM FOR: [redacted] STAT

SUBJECT: Life Preserver, Navy Type LPA-1

1. Attached is a copy of an article from Naval Air Systems News, Vol. 1, #4, concerning a 65 lbs. buoyancy life preserver that looks interesting. I wondered if you, through your U.S.N. connections, might get your hands on one for testing/evaluation, etc., with respect to our equipment. I've indicated the office symbol for the author and the manufacturer's address on the article.

2. Also of interest is the short note at the end of the article (page 24) regarding NOMEX flight coveralls.

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Attachment:
As noted

meet any noise situation is unrealistic. Any modification in which the three basic requirements mentioned previously are not considered could introduce unacceptable tradeoffs such as additional weight and bulk on the head which would greatly increase head/neck hazard under severe acceleration conditions. Even though some relief from the excessive noise level in the cockpit can be obtained by helmet improvements, this approach is considered only as an interim measure.

Action is being taken by NAVAIR to resolve the noise problem at its source, such as engine, aerodynamic design, and insulation.

AIRCREWMAN'S NEW LIFE PRESERVER LPA–1

Manufactured by: Aqua Research & Development Corp. Downing Town, Pa.

By J. J. Mellon (Jack Mellon, ACED)
Aerospace Crew Equipment Department
Naval Air Development Center Johnsville
Warminster, Pa.

Unclassified

ABSTRACT

A new life preserver with 65 pounds of buoyancy has been designed and developed in-house by the Aerospace Crew Equipment Department (ACED). Initially called the Mark 6 preserver but redesignated the LPA–1, it has been found capable of use with every existing item of summer and winter combat flight clothing and survival equipment configuration of Naval aviators. The LPA–1 permits mid-air inflation with either the integrated or nonintegrated parachute and can also be used with the nonparachute flight configuration. The LPA–1 offers cockpit dry wear and work comfort and water-flotation characteristics superior to any life preserver in current use. The new preserver will permit servicewide standardization to a single, common-design life preserver for the Navy aircrewman in lieu of the three different and less adequate types in current use (the Mk 2, Mk 3, and Mk 4). Manufacturing, logistics, and cost-saving advantages are obvious.

Description of LPA–1

The new life preserver is an externally donned, one-size, adjustable type. The assembly consists of an outer cover and an inner inflatable flotation element (Figure 1).

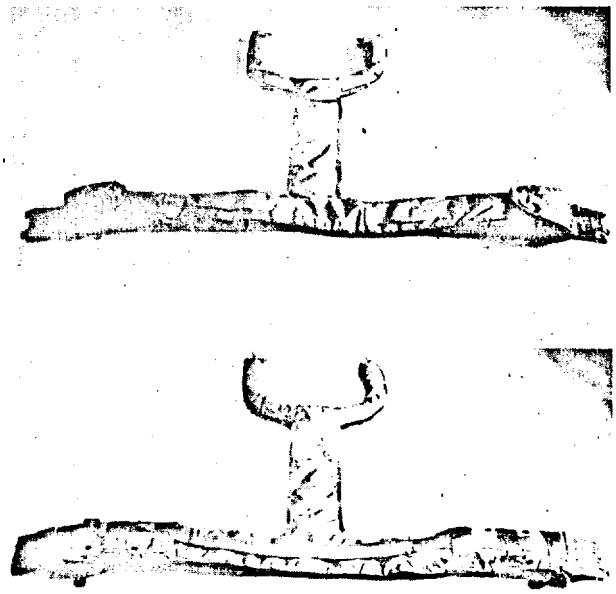

Figure 1.—LPA–1 front and back.

Cover. The cover is made of MIL–C–81395(AS) coated nylon duck (9.5 oz. sq. yd.) which features Velcro fastener strips that permit waist-size adjustment from size 30 to size 43. The cover also has an adjustable belt that anchors the buoyant thrust of

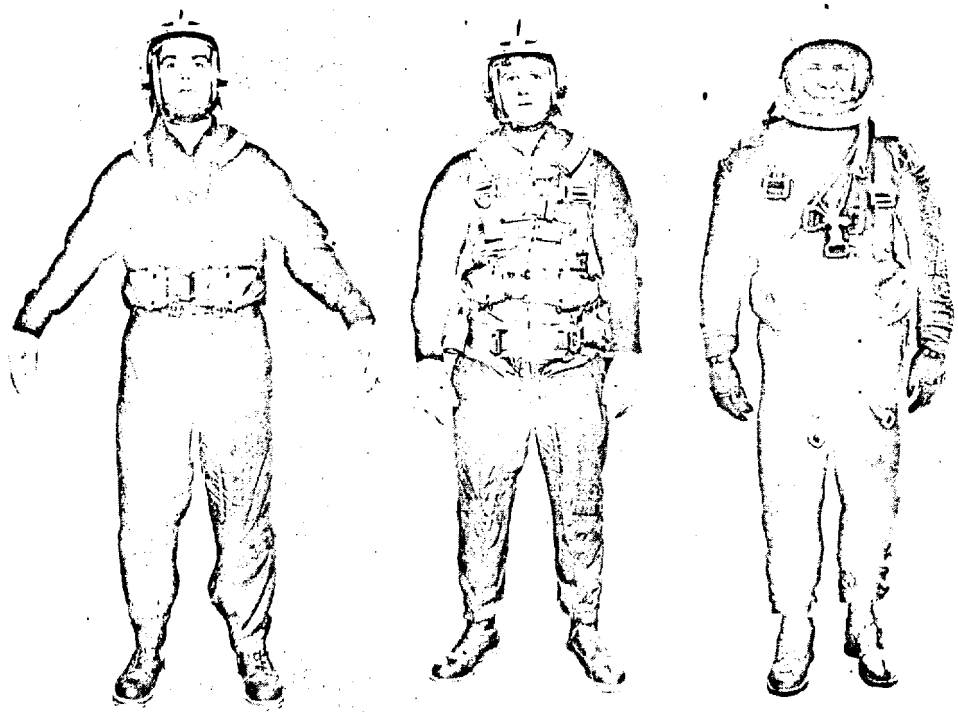

Figure 2.—Packed LPA–1 on flight suit, MA–2 harness and full pressure suit.

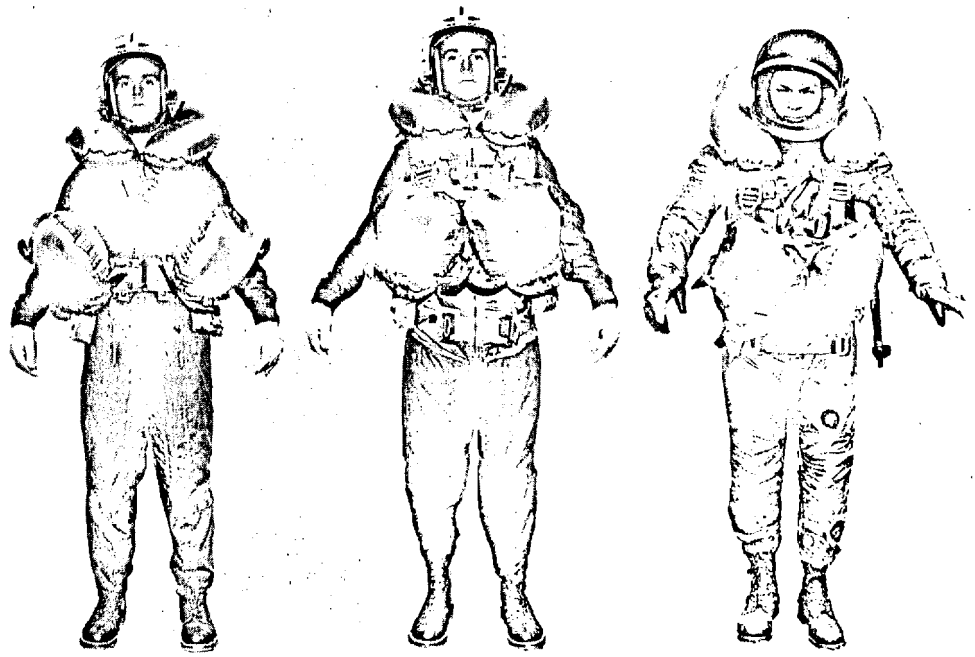

Figure 3.—Inflated LPA–1 with flight suit, MA–2 harness and full pressure suit.

the waist lobes of the preserver when the preserver is attached to the summer or winter flight suit in the nonintegrated parachute harness or no-harness configuration. When used with the integrated parachute harness, the waist section of the preserver is anchored to the torso suit in the same manner as the Mk 3C preserver (Figure 2). Snap hooks projecting from each lobe of the collar assembly are mated to two adjustable D-ring/buckle assemblies on the upper frontal area of the summer or winter flight suit or torso harness suit, as the case may be, to secure the collar section of the preserver to the flight garment. Optionally, two Mk 13 Mod O signal flares can be installed in a small pouch beneath the right inflation lobe cover, and a similar pouch to contain two dye markers can be attached to the left inflation lobe cover. The pouches are secured by snap hooks to small D-rings on the lobe covers.

Inflatable Flotation Element. The life preserver element is securely anchored to and installed inside the cover and is removable. The preserver is constructed of MIL–C–19002B coated fabric and provides approximately 65 pounds of buoyancy at 70° F. at an internal pressure of 1.5 p.s.i.g. when inflated by the CO_2 gas cylinders. Two CO_2 cylinder holders (Type II, MIL–I–23145, with modified lanyard), two 28–gram capacity CO_2 cylinders, two improved oral inflation valves in flexible tubes, and two standard manifolds (MIL–V–6077), comprise the inflation systems. The collar section is inflated by one CO_2 cylinder and the front buoyancy lobes are inflated by the other CO_2 cylinder to obtain two independent buoyancy sections. Each section is also orally inflatable. Upon actuation of the inflation system, the collar and front buoyancy lobes "pop out" of the cover (Figure 3). Compatibility of the LPA–1 with the nonintegrated parachute system and capability of inflation prior to water entry are depicted in Figure 4.

Development Background

In an earlier study,[1] ACED reported the current

[1] Study and Development of Rescue and Survival Flotation Systems and Their Components, Report NAEC–ACEL–519, May 1964.

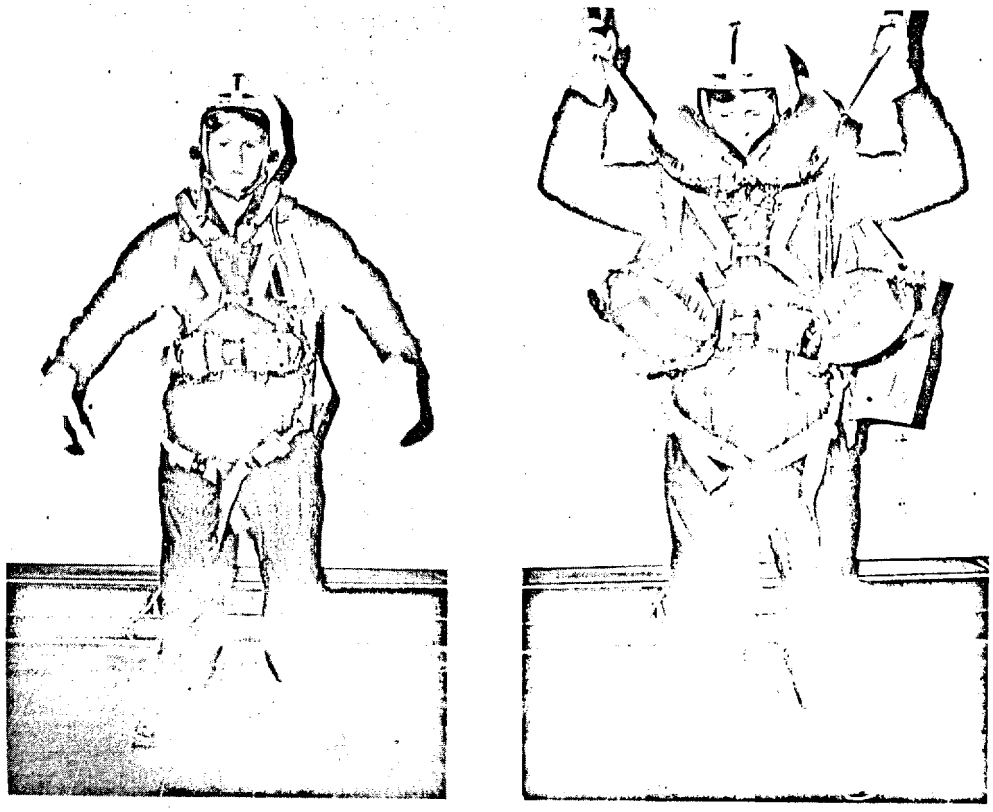

Figure 4.—LPA–1 with nonintegrated harness.

Naval aviation life preservers as unsatisfactory in varying degrees with respect to their bulk, dry wear, and flotation characteristics. Although not a detailed study, from it the following determinations were made:

The *Mk 2 Life Preserver* used mostly in nonejection aircraft has only 20 pounds of buoyancy when inflated with CO_2 gas which is not sufficient buoyancy to support the combat-configured flier in the open sea. Abrasion in the neck area after prolonged flights was also a common complaint.

The *Mk 3 Life Preserver* used with ejection-type aircraft has 60 pounds of buoyancy which is adequate but the buoyancy is so misplaced that it requires the user to expend physical effort in the water to remain upright. Also, flight surgeons reported that the bulk of the Mk 3C in the lumbar area of the body was causing back injuries during catapult shots.

The *Mk 4 Life Preserver* used with the full pressure suit has only 30 pounds of buoyancy and barely supports the man in the water if the suit rips and floods out.

The report further indicated that a new life preserver system capable of installation *inside* various existing flight clothing, which reduces or eliminates bulk from the frontal, underarm, and back areas of the aviator to provide good dry-wear characteristics, was being developed. The preserver unit of this system (called the Mk 5 preserver) was specifically designed to provide flotation characteristics superior to those of the three current preserver types. Development efforts involving flight clothing with integrated Mk 5 flotation were completed in 1965; contracts were let and the developed items delivered to ACED in 1966. However, Vietnam combat needs for land-survival equipment were noted and field evaluation was delayed until the items were modified with pockets to contain necessary land-survival aids.

Quantities of three types of clothing—the summer flight suit with integrated flotation, the torso suit with integrated flotation, and the flight suit with internal parachute harness and integrated flotation were issued to field evaluators in February and May 1967.

Vietnam Problems

Initial problems of life preservers in current use were further aggravated by the Vietnam combat need for land-survival equipment which was being stowed on the upper torso of the aircrewman via the survival vest (SV). The weight of this land-survival equipment requires additional buoyancy for water support and the location of this weight on the upper torso positions the user in an awkward unbalanced attitude in the water when using current-issue preservers.

In June 1966, the Commander Naval Air Force, Pacific Fleet, requested that a priority be assigned the development of an acceptable emergency flotation preserver to replace the underbuoyant Mk 2 preserver and further specified that the replacement preserver have the capability of inflation prior to water entry when used with the *nonintegrated parachute*. About the same time, it was determined that the Mk 2 preserver was also inadequate for the A–1 H/J Yankee Tractor Rocket Escape System and that a replacement preserver with capability of inflation prior to water entry when used with the *integrated parachute system* was also required.

Coincidentally, reports on Vietnam land downings were clearly indicating that the aircrewman in a land escape and evasion situation had little need for sea-survival equipment—except for the detection aids. It was evident that any new life preserver should be an externally donned type with quick-doffing capabilities. Since the previously developed Mk 5 preserver—which was made specifically for installation *inside* flight suits—had exhibited flotation characteristics superior to any existing current type of preserver, a new version of the Mk 5 made specifically for *external* donning was conceived.

Development Goals and Tests

The goals of the new preserver, initially called the Mk 6 but finally designated the LPA–1, follow.

PROPERTY	DEVELOPMENT GOAL
Buoyancy (CO_2)	Approximately 65 pounds at 70° F. to provide adequate free board and reserve buoyancy for the combat-configured aircrewman.
Internal Pressure	Approximately 1.5 pounds.
Compartmentation	Two attached but independently inflatable buoyancy chambers. Each chamber to be located in a different body area to independently provide balanced flotation.
Flotation Angle	To position the head-to-toe-equipped aircrewman automatically at an approximate 45° angle to water level and to require no physical effort to maintain this position.
Rotation	To rotate relaxed survivor automatically from face-down to face-up position.
Head Support	To protect occipital area against wave slap.
Dry Comfort	No bulk in lumbar area; no discomfort in collar area.
Installation	To be externally donned without interference to harness or restraint straps. Preserver to have quick-doff capability.
Inflation Procedure	To be capable of inflation in mid-air or in water with either hand and without interference with integrated or nonintegrated parachute harness releases.

Because of differences between the nonintegrated and integrated parachute harness systems, initially two different types of preservers were developed. It was later determined, however, that they would be consolidated to a single design. In December 1966 a contract was let for 36 of the new LPA–1 preservers which were distributed for evaluation in March and April 1967 to the Commander Naval Air Force, Pacific Fleet; Commander Naval Air Force, Atlantic Fleet; Naval Aerospace Recovery Facility; Helicopter Combat Support Squadron *Two*; and Naval Ordnance Test Station.

By May 1967, reports indicated the new LPA–1 had been tested successfully for:

a. Live parachute land- and water-jump performance, flotation performance, high-shock canopy opening, and low-speed bailout characteristics by Naval Aerospace Recovery Facility, El Centro.

b. Cockpit and comfort characteristics in A–1 and A–4 aircraft by Commander Fleet Air, Alameda.

c. Under-the-helicopter pickup performance by Helicopter Combat Support Squadron *Two*, Lakehurst.

d. Resistance to high-speed ejection effects of 524 KIAS by Naval Missile Center/Naval Ordnance Test Station.

e. Underwater egress capability and open-sea raft entry performance by ACED.

All evaluators listed proposed minor modifications to the initial design preserver, but none of the proposed changes were of such a nature that a retest of the improvements was required. The overall field-evaluation results and acceptance indicated that the new LPA–1 essentially had met the development goals and had overcome the basic low-buoyancy and in-the-water imbalance common to current-use preservers.

Before completion of the field evaluation, the LPA–1 was selected for use with the A–1 H/J Yankee Tractor Rocket Escape System. LPA–1 Life Preservers produced from an earlier ACED guide model are being delivered by the Stanley Aviation Corp., Denver, Colo., with the Yankee Escape System. (See article, this issue, entitled "Emergency Escape at the End of a Rope.")

Current Status

A formal specification for the LPA–1 was scheduled to be forwarded to the Naval Air Systems Command in September 1967.

FORRESTAL Fire Proves Effectiveness of New Fire-Resistant Clothing

The newly adopted Navy flame-retardant flight coveralls and gloves were credited with saving many aircrew personnel during the *Forrestal* fire from severe skin burns. It was observed that those who were burned while wearing the clothing sustained burns only where not covered by the clothing. In one instance, a man in a Navy flight suit crawled across 100 feet of fiery nonskid flight deck without even skinning his knees.

The summer flight coverall was developed by the Naval Air Systems Command (NAVAIR) under its continuing program to provide Naval Aviation personnel with maximum fire protection consistent with pilot comfort and cockpit compatibility. This coverall was first introduced into the Navy supply system over 2 years ago and has replaced the flame-retardant-treated cotton khaki and international orange-colored coveralls. The new flight suits are made of NOMEX, an inherently flame-resistant polyamide fiber of the nylon family which does not support combustion, and resists heat up to approximately 800° F. At this temperature it chars, instead of melting, thus eliminating the hot melt/drip hazard associated with nylon garments. In addition, its abrasion and snag-resistant qualities are excellent, comparing favorably with those of nylon.

The specially designed NOMEX knitted-fabric-back leather glove has been under development by NAVAIR for the past 4 years. Introductory fleet quantities of approximately 6,000 pairs were first issued in late 1966, with the bulk going to squadrons deployed in Southeast Asia combat areas. Pilot preference has indicated that the new glove is the most comfortable, best fitting, and coolest for summer flying of any worn. Evaluation quantities have been made available to both the Army and Air Force, which are currently testing the new flight gloves for possible standardization purposes.

(Unclassified)